Independent Schools Examinations Board

COMMON ENTRANCE EXAMINATION AT 13+

SCIENCE

PHYSICS

MARK SCHEME

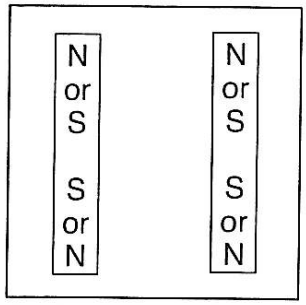
This is a suggested, not a prescriptive, mark scheme.

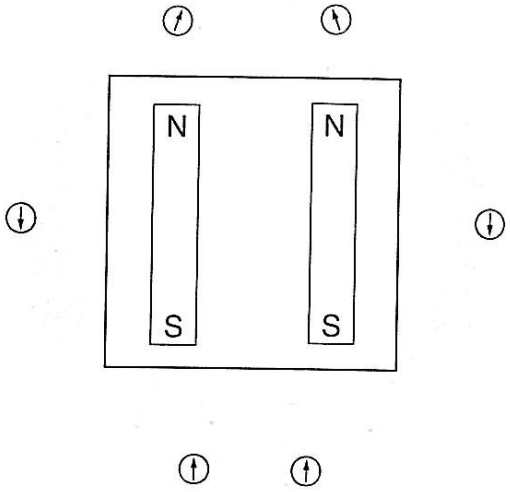
Wednesday 9 June 2010

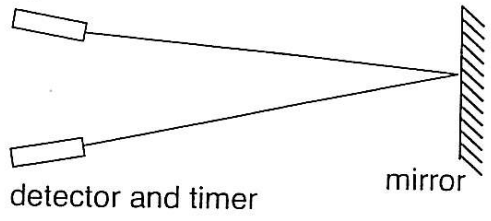
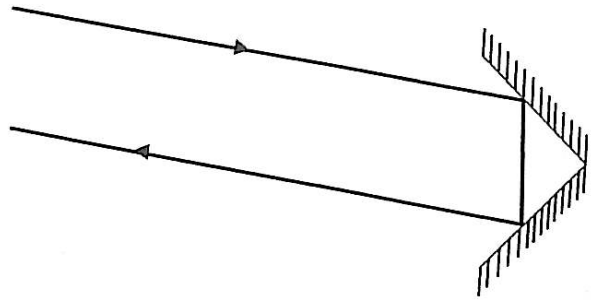
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Although candidates should be encouraged to show their working clearly, full marks should be awarded for the correct answer to numerical questions even if the working is not shown.

Q.	Answer	Mark	Additional Guidance
1. (a)	copper	6	
(b)	thermal energy		
(c)	galaxy		
(d)	balanced forces acting on it		
(e)	the Earth rotates once every day		
(f)	increase in pitch		
2. (a)	*e.g.*  	2	bar magnets must be vertical similar poles must be at the top with their opposites at the bottom
(b) (i)	*suitable equipment:* *e.g.* plotting compass/magnet/some string	1	

Q.	Answer	Mark	Additional Guidance
(b) (ii)	move plotting compass/magnet round the outside of the box compass needle will point towards south-seeking pole of magnet/away from north-seeking pole of magnet third mark is for correctly linking the result of their test to their answer to (a), e.g. compass needle will point away from north-seeking poles  	3	*or* suspend box using string *or* similar argument about forces on poles of external magnet, *or* settling of suspended box in particular direction compasses drawn on diagram with correct poles can gain all 3 marks note that poles (and hence compasses) could all be reversed
3. (a)	speed of light is (very) fast so time is too short to measure	2	credit sensible alternatives
(b)	*suggestion:* flash would be seen followed by a (long) delay before the bang is heard *explanation:* speed of sound is (much) slower than speed of light	2	
(c) (i)	$\text{speed} = \frac{\text{distance}}{\text{time}}$	1	*or* any correct arrangement
(ii)	$\text{time} = \frac{\text{distance}}{\text{speed}} = \frac{1500}{300}$ $= 5$ s	3	unit essential for third mark

Q.	Answer	Mark	Additional Guidance
(d)	battery, LED and switch in series correct circuit symbols	2	allow a cell rather than a battery (although an LED is unlikely to work with a single cell)
(e)		1	rays approximately correct, judged by eye no arrows needed
(f)		2	1 mark for approximately correct reflection at first mirror 1 mark for approximately correct reflection at second mirror
(g)	light is always reflected back in the direction from which it came/so that it can be seen from Earth	2	
4 (a)	distance = 5 km × 2 × 5 = 50 km	1	no mark if not 10 km per day
(b)	distance = 50 × 37 = 1850 km	1	
(c)	petrol saved = $\frac{3700}{100}$ × 9 = 333 litre	2	ignore unit
(d)	amount of CO_2 = 3700 × 0.22 = 814 g = 0.8 kg	2	
(e)	*any two sensible reasons plus an explanation:* *e.g.:* uses less petrol so helps preserve fossil fuels/produces less CO_2/costs less/reduces global warming gives Matthew more exercise so helps to keep him healthy	4	allow two different advantages of using less petrol, e.g. less CO_2 and cost

Q.	Answer	Mark	Additional Guidance
5. (a)	Saturn	1	
(b)	Mercury it is closest to the Sun	2	allow also Venus because of its atmosphere
(c)	Jupiter	1	
(d)	Venus rotates in the opposite direction to all the other planets	1	
(e) (i) (ii)	a (natural) body which orbits a planet Titan is a long way from the Sun and so is very cold	1 1	
6. (a)	$\text{density} = \frac{\text{mass}}{\text{volume}}$	1	*or* any correct arrangement of this
(b)	*explanation to include:* known volume of water in measuring cylinder put gravel into water (shake gently to remove air) measure new volume	3	
(c)	mass of the gravel	1	
(d)	8.4 cm	2	allow 8.3 to 8.5 cm unit essential for second mark
(e)	3.0 cm × 2.5 cm × 8.4 cm = 63 cm^3	2	use candidate's value 63.75 cm^3 if answer to (d) was 8.5 cm, 75 cm^3 if answer to (d) was 10 cm
(f)	$\text{density} = \frac{44.1}{63}$ = 0.7 g/cm^3	3	0.69 g/cm^3 if 63.75 cm^3 used, 0.59 g/cm^3 if 75 cm^3 used

Q.	Answer	Mark	Additional Guidance
(g)	*two relevant comments, e.g.* *advantage:* brick is an irregular shape almost impossible to measure its volume any other way *disadvantage:* water will be absorbed into the brick measurement of volume will be inaccurate (too small)/mass of brick will be increased by absorbed water	2 2	
Total		**60**	